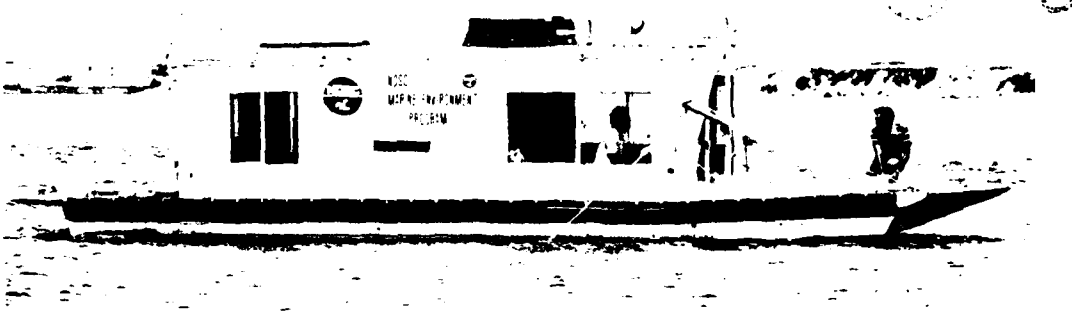
AD-A094 700 NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA F/G 13/2
THE MESC PROGRAM FOR MARINE ENVIRONMENTAL QUALITY ASSESSMENT.(U)
SEP 80
UNCLASSIFIED NOSC/TD-383 NL

(12)

(1) Technical Document 383

LEVEL II

MESC



The MESC Program for Marine Environmental Quality Assessment

September 1980

(13)

Naval Ocean Systems Center • San Diego, California

- On-site analysis
- Real-time water quality monitoring
- Rapid deliveries of information
- Expert technical support

MESC

THE MESC PROGRAM FOR MARINE ENVIRONMENTAL QUALITY ASSESSMENT

The Need . . .

Federal and State regulatory agencies require the Navy to make environmental assessments whenever its activities might disturb existing estuarine ecosystems. These assessments are generally carried out by contractors prior to the preparation and filing of an environmental impact statement.

Environmental Field Divisions (EFDs) and activities charged with awarding environmental contracts and overseeing environmental assessments are often faced with the need to obtain preliminary technical information. These data, which in general are of a physical, chemical, and biological nature, help define the spatial and temporal boundaries of the potential impact of new activities and are necessary before sound contractual agreements can be made. By its nature, this information must be readily available to the Officer-In-Charge and must be supported by expert consultants.

The Program . . .

To meet the above need, the Marine Sciences Division of the Naval Ocean Systems Center has developed a program which features a transportable, instrumented houseboat known as the Marine Environmental Survey Craft (MESC) for the measurement of certain physical, chemical and biological parameters of environmental importance (figure 1.). The principal aim of the program is to provide a rapid-response environmental capability; ie, to be on site, make measurements, and place a report in the hands of the Commanding Officer or the EFDs in minimum time. Thus the emphasis is on shipboard and *in situ* analyses.

The MESC, which is designed to operate in estuarine and other protected inshore waters, is a 38-foot, shallow-draft houseboat containing both a dry lab and a wet lab with a running seawater system. Most of the environmental sensors on board are

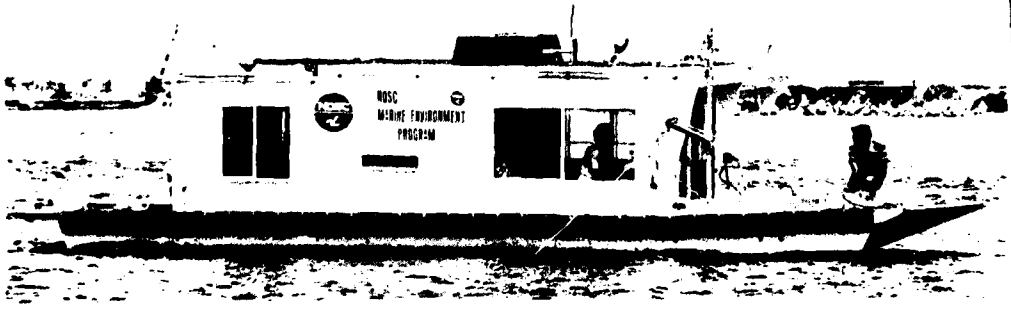


Figure 1. Marine Environmental Survey Craft (MESC).

designed to make measurements on a flowing stream of water on or near a real-time basis. The system is designed for both vertical and horizontal profiling and can be used for environmental mapping over large areas. In addition, discrete water samples can be collected by a noncontaminating pump system. Data collected are stored on an onboard minicomputer-based data recorder which is also used for data analyses and graphics. Although the craft is designed for underway mapping, it is also well suited for stationary monitoring near Naval ships, shore activities, outfalls, and dredging operations.

The houseboat and analytical systems are supported by the staff of the Marine Sciences Division, which consists of biologists, chemists, and oceanographers. The staff operates the craft, makes measurements, produces data reports, and is available for data analyses and consultations as needs arise.

The Craft . . .

The physical specifications of the craft are provided in table I. Figure 1 shows the vessel during a horizontal profiling operation in San Diego Bay. The vessel can be transported nearly anywhere in the continental United States by truck and requires moderate (15 tons) crane facilities for lowering it into the water. Since it is self-powered, it does not require assistance once it is launched.

The laboratory area is large for a vessel of this size and its equipment is comparable to that of a small land-based laboratory. It contains a small freezer and a small refrigerator. Fresh water and laboratory quality deionized water are available. A principal survey instrument is a towed Interocean CTD environmental probe for the measurement of temperature, conductivity, oxygen, depth, and turbidity. A featured device is the NOSC-developed trace metal analyzer. This instrument analyzes seawater for Zn, Cd, Pb, and Cu at 0.1-part-per-billion level without preconcentration steps at near real time. Other devices available are flowthrough manifolds containing specific ion electrodes for the measurement of pH, reactive "Cu", $S^{=}$, etc, on flowing streams. Two Turner-Designs flowthrough fluorometers are available for studies of phytoplankton biomass, turbidity, and oil detection. Figure 2 shows a portion of the interior of the craft.

Table II shows the equipment presently available on the craft. Other equipment and instrumentation are available through loan or lease. Figure 3 is a schematic of the vessel's instrumentation package.

Table I. Marine Environmental Survey Craft (MESC) physical specifications.

Length:	38 ft
Height:	10 ft 6 in
Width:	11 ft 3 in
Weight:	13 tons
Draft:	18 in (30 in to bottom of propeller)
Speed:	8 knots
Engine:	Chrysler 318
Electrical Power:	12-volt system and 6.3-kW Kohler generator, 120 V/60 Hz (54 A) regulated by frequency converter (21 A)
Fuel Capacity:	100 gal gasoline
Water Capacity:	60 gal
Range:	120 mi

Figure 2. MESC interior.

Figure 3. MESC instrumentation package.

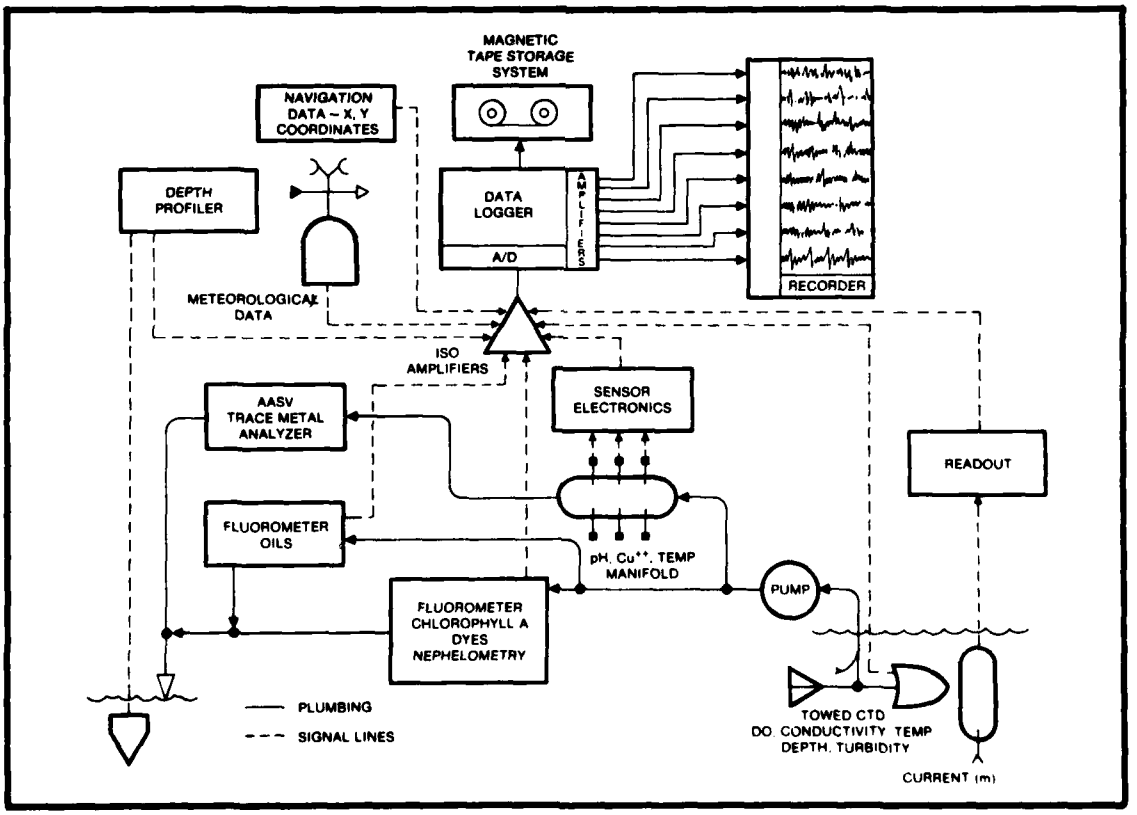


Table II. Equipment/instruments, capabilities, and functions.

EQUIPMENT/ INSTRUMENTS	CAPABILITIES	FUNCTION
	Interocean CTD Environmental Probe	
	Temperature: -5° to 45° C (±0.02° C)	Continuous horizontal mapping and vertical profiles.
	Oxygen: 0 to 20 ppm (±0.2 ppm)	
	Depth: 0 to 100 m (±3%)	
	Salinity: 0 to 40 ppt (±0.02 ppt)	
	Turbidity: 0 to 100% T (±1%)	
	Pumped Flowthrough Seawater System	
A. Specific Ion Electrodes	pH: 0 to 14 (±0.01 pH units)	Continuous horizontal mapping and vertical profiles.
	Cu^{++}: 0 to 100 ppb (±5 ppb)	
	$S^{=}$ and other electrodes are under investigation	
B. Automated Trace Metal Analyzer	Cu: 0.5 to 100 ppb (±0.2 ppb)	Semicontinuous horizontal mapping and vertical profiles.
	Pb: 0.5 to 100 ppb (±0.2 ppb)	
	Cd: 0.5 to 100 ppb (±0.2 ppb)	
	Zn: 0.5 to 100 ppb (±0.2 ppb)	
C. Turner-Designs Fluorometer	Chlorophyll A: 0 to 1000 ppb (±0.005 ppb)	Continuous and vertical mapping of biomass.
	Rhodamine B: 0 to 1000 ppb (±0.01 ppb), circulation patterns	Dye studies to determine currents.
	Light scattering by particles	Nepheloid layers, turbidity.
	UV fluorescence: to 5 ppb oil in water	Oil detector.
	Discrete Instrumentation	
A. Cold Vapor Atomic Absorption Spectrophotometer	Mercury in seawater: 0 to 100 ppb (±0.002 ppb)	Detect mercury contamination.
B. Savonius Rotor Current Meter	Currents: 0 to 300 cm/s (±0.5 cm/s)	Mixing rates, currents.
C. Irradiance Meter	Relative irradiance (downwelling light relative to surface)	Estimate turbidity, light intensity.
D. Biological Sampling Gear, Scuba Equipment	Nets (fish, plankton)	Biological collectors.
	Corers	Biological collectors.
	Dredge	Biological collectors.
	Refrigeration/freezers	Storage of samples.
E. Data Logger	Hewlett-Packard HP21MX system with HP 2645 terminal	Data acquisition.

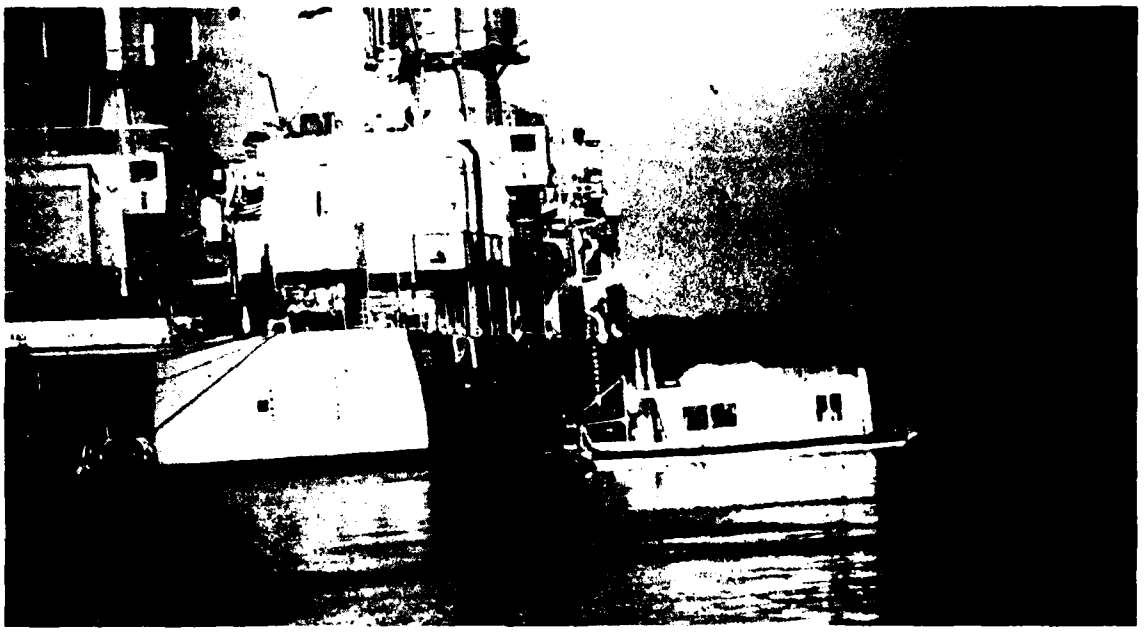


Figure 4. MESC used in assessment of environmental impact of *in situ* hull-cleaning operations.

Who Needs It? . . .

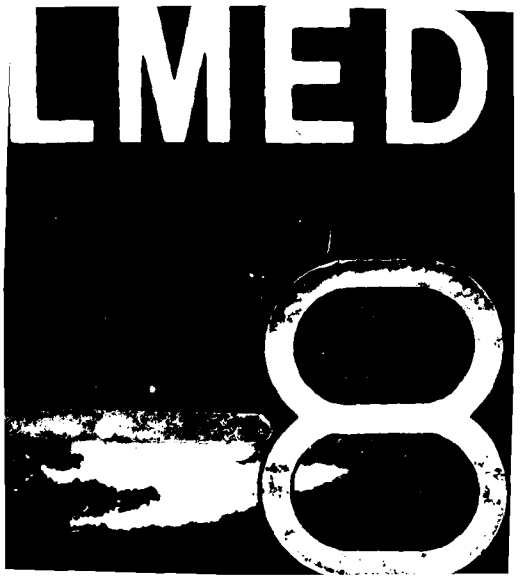
The MESC program would be of use to engineering officers and environmental officers in the various NAVFAC Engineering Field Divisions (EFDs) contemplating a general environmental survey before awarding a major contract for an environmental impact assessment. Commanding Officers faced with complaints or possible lawsuits for environmental damages could use the MESC program to define the limits of the Navy's liabilities. Officers-in-Charge of Construction, Operations, and Engineering, faced with the possibility of causing environmental damages in the course of normal operation, could use the information supplied by the MESC and its staff.

In the past, the MESC has been utilized to assess the environmental impact of *in situ* hull-cleaning operations (figure 4). The MESC capabilities were used to determine the ambient trace metal concentration, its temporal variations, and eventual impact of the operations.

How To Get It . . .

In order to demonstrate the utility of the MESC program for environmental monitoring, its services will be made available in FY81 and 82 to the various NAVFAC EFDs and their activities on a cost-reimbursable basis. The Naval Environmental Protection Support Service (NEPSS), through its Naval Energy and Environmental Support Activity (NEESA), is charged with reviewing and approving requests for environmental studies as well as with reviewing and distributing the results of environmental studies. Thus requests for environmental monitoring involving the MESC program and any questions about the program should be addressed to:

Mr. Gary G. Gasperino
(AUTOVON 360-4980)
Code 22B, NEESA
Pt Hueneme, CA, 93043


LMED
8